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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR		ATTORNEY DOCKET NO.
09/200,495	11/25/98	VAN BUSKIRK	P	2771-337(PCB

MMC1/1003

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EXAMINER	
HU,S	
ART UNIT	**PAPER NUMBER**
2811	

DATE MAILED: 10/03/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.	Applicant(s)
09/200,495	Buskirk et al.
Examiner	**Group Art Unit**
Shouxiang Hu	2811

☒ Responsive to communication(s) filed on *Jul 2, 2000*

☒ This action is **FINAL.**

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire *three* month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claim

☒ Claim(s) *1-50* is/are pending in the applicat

Of the above, claim(s) *1-39* is/are withdrawn from consideration

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) *40-50* is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☒ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____ .

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☐ Notice of References Cited, PTO-892

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). *6*

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

— SEE OFFICE ACTION ON THE FOLLOWING PAGES —

DETAILED ACTION

Election/Restriction

1. Claims 1-39 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention and canceled, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 5.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 40 -50 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 1 recites the limitation "the ferroelectric or high e film material at said surface and at a depth from said surface that is less than 25 Angstroms has an atomic composition of oxygen and constituent metals that are related in whole integer proportions to one another"; but, the disclosure lacks an adequate description regarding how to control the depth of the surface layer that has an atomic composition of oxygen and constituent metals that are related in whole integer proportions to one another, so that it is less than 25 Angstroms.

4. Claims 40-50 are further rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a ferroelectric capacitor having a stoichiometrically oxidized dielectric surface layer in which oxygen and metal(s) are related in certain whole integer proportion(s) to one another, does not reasonably provide enablement for a ferroelectric capacitor having a dielectric oxide surface layer in which oxygen and metal(s) are related in other whole integer proportion(s) to one another. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 40-50, insofar as in compliance with 35 U.S.C.112, are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoyama et al. (5,852,307).

Aoyama et al. (5,852,307) disclose a microelectronic device structure (Figs. 15-17), comprising: a top electrode layer (8, Ru oxide) on a ferroelectric film material (9). And, Aoyama

et al. (5,852,307) further disclose that the top electrode layer is deposited in an oxygen-containing atmosphere (see col. 11, lines 61-67 and col. 12, lines 1-2).

It is noted that the atomic compositions of oxygen and constituent metals can be related inherently in whole integer proportions to one another in a ferroelectric material being stoichiometrically complete in oxygen concentration.

Although Aoyama et al. (5,852,307) do not expressly disclose that a substantially stoichiometrically oxidized surface layer is formed with its depth being less than 25 Angstroms, it is noted that the oxygen concentration and its profile in the ferroelectric film surface are well recognized parameters of importance subject to routine experimentation and optimization.

Therefore, it would have been obvious to one of ordinary skilled in the art at the time the invention was made to make the microelectronic device of Aoyama et al. (5,852,307) with the ferroelectric film material being stoichiometrically oxidized in the surface layer with a depth less than 25 Angstrom through routine experimentation and optimization, so that the performance of the ferroelectric capacitor would be optimized.

Regarding claims 41-44, Aoyama et al. (5,852,307) also disclose that the ferroelectric film material can be formed with BST and PZT (see col. 19, lines 46-58).

Regarding claims 45-50, Aoyama et al. (5,852,307) do not expressly disclose that the ferroelectric film material can be formed with a strontium bismuth tantalate material; and, that the top electrode layer comprises a material selected from Pt, Ir, Pd, Rh, their oxides or their alloys. It is noted that it is old and well known in the art that ferroelectric film material can be

formed with a strontium bismuth tantalate material; and, that each of the materials of Pt, Ir, Pd, Rh, their oxides and their alloys is one of the commonly used materials for the top capacitor electrode layer.

Therefore, it would have been obvious to one of ordinary skilled in the art at the time the invention was made to make the microelectronic device of Aoyama et al. (5,852,307) with the ferroelectric film material being formed with a strontium bismuth tantalate material, and/or, with top electrode layer being made of a material selected from Pt, Ir, Pd, Rh, their oxides and their alloys, so that more design choices and better process flexibility would be obtained.

7. Claims 40-50 are further rejected under 35 U.S.C. 103(a) as being obvious over Mihara et al. (5,561,307).

Mihara et al. (5,561,307) disclose a microelectronic device structure (Fig. 20), comprising: a top electrode layer (176) on a ferroelectric film (174) with a conductive metal oxide (Ru Oxide) for the purpose of compensating for a potential oxygen deficiency region in the ferroelectric surface layer.

Although Mihara et al. (5,561,307) do not expressly disclose that the surface layer with a depth of less 25 Angstroms has an atomic composition of oxygen and constituent metals that are related in whole integer proportions to one another, it is noted that atomic composition of oxygen and constituent metals can be related inherently in whole integer proportions to one another in a ferroelectric material being stoichiometrically complete in oxygen concentration; and that the

oxygen concentration in the surface layer is a well recognized parameter of importance subject to routine experimentation and optimization.

Therefore, it would have been obvious to one of ordinary skilled in the art at the time the invention was made to make the microelectronic device of Mihara et al. (5,561,307) with the ferroelectric film's surface layer with a depth less than 25 Angstroms being substantially stoichiometrically complete in oxygen concentration, so that a ferroelectric capacitor with improved performance would be achieved.

Regarding claims 45-50, Mihara et al. (5,561,307). do not expressly disclose that the ferroelectric film material can be formed with a strontium bismuth tantalate material; and, that the top electrode layer comprises a material selected from Pt, Ir, Pd, Rh, their oxides or their alloys. However, it is noted that it is old and well known in the art that ferroelectric film can be formed with a strontium bismuth tantalate material; and, that each of the materials of Pt, Ir, Pd, Rh, their oxides and their alloys is one of the commonly used materials for the top capacitor electrode layer.

Therefore, it would have been obvious to one of ordinary skilled in the art at the time the invention was made to make the microelectronic device of Mihara et al. (5,561,307) with the ferroelectric film material being formed with a strontium bismuth tantalate material, and/or, with top electrode layer being made of a material selected from Pt, Ir, Pd, Rh, their oxides and their alloys, so that more design choices and better process flexibility would be obtained.

Response to Arguments

8. Applicant's arguments filed on July 2, 2000, have been fully considered but they are not persuasive.

With respect to Applicant's argument that the ferroelectric surface layer in Aoyama et al. (5,852,307) is readily reducible and is not inherently stoichiometric, it is noted that it is commonly known in the art that a stoichiometric oxygen concentration in the surface layer is very critical to the performance of the ferroelectric capacitor, and Aoyama et al. (5,852,307) teach to form the RuO electrode though sputtering in the presence of oxygen, as one the methods advocated in Applicant's disclosure. It is therefore well within the ordinary skilled in the art to make the ferroelectric capacitor with the ferroelectric surface layer being substantially stoichiometrically oxidized through optimizing the sputtering conditions, so that an optimized ferroelectric film can be achieved.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax Center number is (703) 308-7722 or 308-7724. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

Any inquiry concerning this communication or any earlier communication from the Examiner should be directed to ***Shouxiang Hu*** whose telephone number is **(703) 306-5729**. The Examiner is in the Office generally between the hours of 8:00AM to 5:30PM (Eastern Standard Time) Tuesday through Friday.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is **(703) 308-0956**.

Shouxiang Hu

September 26, 2000

Minh Loan Tran
Primary Examiner